



WPI

WORCESTER POLYTECHNIC INSTITUTE

Interactive Qualifying Project

Teaching Practicum

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After spending two terms teaching at Doherty Memorial High School, a very demographically diverse group as discussed in this paper. This paper also addresses my competency in the five Standards for Educators as given by the Massachusetts Department of Secondary Education. Lastly the details of my teaching are addressed describing the application of my current education and my specific classes.

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Chapter One

Background on Massachusetts Education

“Education is the most powerful weapon which you can use to change the world.” ~Nelson Mandela

Just as former president of South Africa, Nelson Mandela says in his quote, education is a very powerful weapon. The Massachusetts Department of Elementary and Secondary Education (DESE) understands this vital aspect of humanity. They strive to provide the best education possible to enable their students to change the world. Although there is an understanding that not every child in Massachusetts is going to find a cure of cancer or leave a legacy in the history books, well-educated students are then given the ability to continue onto the rest of the world, making an impact no matter how small.

One major reform made in Massachusetts education was the *Education Reform Act of 1993*. This seven year reform strived to provide “greater and more equitable funding to schools, accountability for student learning, and statewide standards for students, educators, schools and districts.”¹ Some of the major changes included a Common Core of Learning for the entire state that included measureable content standards in many subjects. This lent itself to the creation of the Massachusetts Comprehensive Assessment System (MCAS) testing, graduation requirements, the amount of time in schools, as well as teacher testing.

However before being tested teachers had to attain a newly regulated state licensure. Licenses to be legally improved were now regulated by the state. These included going through

¹ "District/School Administration Administration Education Reform." *Education Reform Progress Report*.

Massachusetts Department of Elementary and Secondary Education, 1 May 1997. Web. 12 Sept. 2013.

three stages of certification to attain the full state licensure. After being licensed, teachers were also held to performance standards, including two new tests, one testing their knowledge of a particular subject matter and the other testing their communication and literacy abilities.

With this reform Massachusetts can now boast that it has the highest mathematics proficiency level in the United States with over 51% according to a Harvard educational study. Following directly behind Massachusetts is Minnesota with 43%. Falling furthest behind is the District of Columbia with just 8% proficiency. Similarly to this Harvard educational study, the Trends in International Mathematics and Science Study (TIMSS), looks at the proficiency of students in math and science grades 4, 8, and 10. In this Massachusetts students consistently score above the U.S. national average as well as the TIMSS scale average. These studies show that overall Massachusetts excels far beyond the average American state in mathematics and sciences.

One factor that may lead to Massachusetts's acceleration in math and science is their use of curriculum frameworks which spell out the guidelines of the content standards. These assist teachers to ensure each student is proficient in the necessary topics. Another step Massachusetts is taking to further its student proficiency is to adopt the Common Core State Standards. These standards will allow the U.S. to continue to further its education program, keeping the states on an equal level. Worcester Public Schools have a 5-phase curriculum review process to improve the curriculum and integrate the Common Core into its standards and further the educational benefits it provides to the students.

Doherty Memorial High School Demographics

Worcester provides many benefits to the students including a diverse socio-economic population. Doherty Memorial High School is no exception and reflects the diversity of

Worcester as a whole, while being significantly more diverse than the rest of the state. As seen in Table 1. Unlike the large difference in ethnic enrollment from state to school, Doherty reflects the gender enrollment of the state fairly accurately as seen in Table 2.

Table 1: Doherty Memorial High School Enrollment by Race and Ethnicity (2012-2013)

Enrollment by Race and Ethnicity (2012-2013)			
Race	% of School	% of District	% of State
African American	14.0	14.2	8.6
Asian	9.7	8.1	5.6
Hispanic	29.5	38.1	16.4
Native American	0.7	0.3	0.2
White	43.7	35.8	66.0
Native Hawaiian, Pacific Islander	0.0	0.0	0.1
Multi-Race, Non-Hispanic	2.5	3.5	2.7

Table 2: Doherty Memorial High School Enrollment by Gender (2012-2013)

Enrollment by Gender (2012-2013)			
Gender	% of School	% of District	% of State
Male	49.8	51.8	51.2
Female	50.2	48.2	48.8

Other factors in the demographic profile of a school are the selected populations such as English Language Learners, low-income students, and students with disabilities. For these populations Doherty generally falls above the state but below the district in terms of percentages

as seen in Table 3 below. In this enrollment population English Language Learners (ELL) are defined as students who do not speak English or whose native language is not English. These students cannot complete their ordinary classwork in English and therefore they begin in a separate instruction classroom of Sheltered English Immersion (SEI). After a year are moved out of an SEI classroom and into a regular class with assistance from an ELL teacher.

Table 3: Doherty Memorial High School Enrollment by Selected Populations (2012-2013)

Enrollment by Selected Populations (2012-2013)			
Title	% of School	% of District	% of State
First Language not English	44.5	44.0	17.3
English Language Learner	25.8	34.3	7.7
Low-income	59.3	73.1	37.0
Students with Disabilities	15.3	20.7	17.0
Free Lunch	52.1	66.8	32.1
Reduced Lunch	7.2	6.3	4.9
High Needs	67.9	81.7	47.9

Keeping in mind the diversity of the school and large special population groups, Doherty still performs relatively well on the MCAS exams as compared to the rest of the state. These tests as discussed earlier assess the students on their proficiency of the curriculum set by the state and reflect upon the teachers and schools. They are also important for gathering information for statistics as well as budgeting and graduation requirements. Looking at the data in Table 4, it can be seen that the 10th grade from Doherty does not perform as well as the rest of the state.

However, when all grades are taken into account Doherty’s performance passes that of the state in every subject.

Table 4: MCAS Test of Spring 2012 for Doherty Memorial High School

MCAS Test of Spring 2012											
Grade and Subject	Proficient or Higher		Advanced		Proficient		Needs Improvement		Warning/Failing		
	School	State	School	State	School	State	School	State	School	State	
Grade 10- English Language Arts	80	88	31	37	49	51	15	9	5	3	
Grade 10- Mathematics	72	78	48	50	24	28	18	15	10	7	
Grade 10- Science and Tech/Eng	58	69	12	24	46	45	30	25	12	6	
All Grades- English Language Arts	80	69	31	19	49	50	15	22	5	9	
All Grades- Mathematics	72	59	48	27	24	32	18	26	10	15	
All Grades- Science and Tech/Eng	58	54	12	17	46	37	30	32	12	13	

This information about the state’s educational system as well as how Doherty compares to the demographics of the state provides a valuable insight into the culture and workings of the school. As an out-of-state college student understanding how the Massachusetts education

system works is very beneficial as I prepare to complete the practicum. Also, coming prepared with information about Doherty itself helps me to be mentally prepared to interact with a very diverse group of students. It also makes me aware of many of the challenges that will come up in dealing with Selected Populations and striving to pass the MCAS exams.

In addition, learning about Doherty as a whole made me more prepared to interact with my three classes, an Advanced Algebra class, and two Pre-Calculus Honors classes. The Advanced Algebra class was a lower level class made up of primarily juniors and seniors. The Pre-Calculus Honors classes were upper level classes with juniors and seniors. Knowing more about the demographics of the school prepared me for some of the challenges faced such as students failing, and the population background such as the number of English Language Learners and the diverse population. Overall being prepared with information has helped me to smoothly start off my teaching practicum.

Chapter Two

Plans Curriculum and Instruction

To ensure teachers are properly equipped to be instructors the Massachusetts Department of Elementary and Secondary Education has a set of five Professional Standards for Teachers. These standards are that the educator plans curriculum and instruction, delivers effective instruction, manages classroom climate and operation, promotes equity, and meets professional responsibilities. The following five chapters will go into detail about how I met each of these standards during my teaching practicum.

The first of these standards is that the educator plans curriculum and instruction. This is further broken down into nine standards. These standards were also met during my student teaching.

- 1. Draws on content standards of the relevant curriculum frameworks to plan sequential units of study, individual lessons, and learning activities that make learning cumulative and advance students' level of content and knowledge.*

Each day a lesson was planned for each class based on the curriculum as laid out in the Common Core, an example lesson can be seen in the attached Appendix. This is an example of a standard given by the Common Core for a high school level Algebra course.

A-REI 3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

To teach this particular standard to my Advanced Algebra students, I first taught how to solve a linear equation when they were given numbers to plug in. I also taught how to graph

linear equations so that the students were able to visualize what they were solving. Each day the lesson was started off with a Do-Now, usually based on a previous lesson. The intention of this was to jolt the students mind and get them thinking about the subject at hand. This was also helpful for lessons that built on one another because it gave a sense of continuity to the lesson.

- 2. Draws on results of formal and informal assessments as well as knowledge of human development to identify teaching strategies and learning activities appropriate to the specific discipline, age, level of English language proficiency, and range of cognitive levels being taught.*

As mentioned previously the daily Do-Now activity was an ungraded, yet formal assessment that was a strong indicator of where the students were on the topic. If none of the students were able to complete the Do-Now, it let me know that the lesson had to be modified to review this topic before moving on. Other formal assessments such as nightly homework and exams, some of which can be seen in the Appendix, were used to evaluate what each of the students had learned and were able to do independently.

Informal assessments such as content specific questions or problems done in class, were good indicators of where the students were struggling with topics. However, it did not always prove to be a good indicator of where each individual student was excelling or struggling.

As a teacher I strived to create a classroom environment where the students were not afraid to ask questions about the material or express their confusion. Knowing my students only made this a better assessment because if one of my stronger students was asking this question, I could conclude many other students were also lost. I reaped the most benefits from this particular informal assessment, because it gave me an understanding of where the students were as I was

teaching the lesson. From there it was very easy to modify the lesson to go into more detail about an aspect of the lesson or do another example problem.

- 3. Identifies appropriate reading materials, other resources, and writing activities for promoting further learning by the full range of students within the classroom.*

In this case the textbook material was chosen for me by my mentor teacher. However I did use other supplementary material. I photocopied pages from old textbooks that explained topics in a different manner and distributed them to students. Other resources such as work pages and practice problems were attained through online websites, workbooks, and resources from other teachers at Doherty. In addition I liked to give my students problems that asked them to write what was incorrect in a sample problem or to write out the process they used to solve the problem.

- 4. Identifies prerequisite skills, concepts, and vocabulary needed for the learning activities.*

As previously mentioned, I often used a daily Do-Now activity to jog student's memory of a particular subject. This often reminded them of the prerequisites necessary for the lesson. I found that especially in my Algebra class I often had to backtrack to review concepts the students had forgotten from Algebra 1, which they took two years prior. In one particular case this meant reviewing how to graph a linear equation by plotting points, before we could move on to using slope-intercept form.

- 5. Plans lessons with clear objectives and relevant measurable outcomes.*

While teaching I found that one critical step in presenting the lesson was to simply write the concept that was being taught on the board. This gave the students a clear objective for the day,

as well as a measureable outcome at the end of class. For example writing “Solving Quadratic Equations” not only helped the students to organize their notes, but it was very clear to them what they were learning and what they were expected to know at the end of the class. Practice problems that were done throughout the lesson gave the students a very measureable outcome to whether they were capable or not of performing the expected task.

6. Draws on resources from colleagues, families, and the community to enhance learning.

During my time teaching I drew upon many resources from my own WPI classes. Particularly with the Pre-Calculus lessons based on finance, I was able to draw on the “cash flow diagram” I had learned in my Project Evaluation class. I was also able to assist the AP Calculus BC class with drawing on different approaches to topics I had learned in my high school classes. There were also topic approaches I learned from my colleagues that had been used a Doherty. Specifically, I learned to teach the “Razzaq Attack” which was a method to factor polynomials when the leading coefficient is not one.

7. Incorporates appropriate technology and media in lesson planning.

One of the main ways I included technology into my lesson planning was through the use of calculators. Many of my students had little to no experience with graphing calculators so simply operations such as graphing lines and using the basic features became a lesson. The use of calculators is a very relevant technology for any students planning on continuing on to college or any further education. This is why I felt it was very necessary to spend quality class time using this technology.

8. *Uses information in Individualized Education Programs (IEPs) to plan strategies for integrating students with disabilities into general education classrooms.*

Particularly in my Algebra class a few of the students were allowed the use of calculators at any time. To integrate these students into the general education of the entire classroom, I strived to create problems that ensured they understood the concept and were not only crunching numbers. To integrate other students into the general education classroom, I spent a large amount of time floating around the classroom while students were working independently. This allowed me to work with individual students on the topic, giving the students with IEPs the specialized attention that allows them to keep up with students in the general education program.

9. *Uses instructional planning, materials, and student engagement approaches that support students of diverse cultural and linguistic backgrounds, strengths, and challenges.*

My main strategy in supporting students of a variety of strengths, backgrounds, cultures, and challenges was to teach using a variety of methods. I strived to make explain each concept in a way that appeals to visual, auditory, and kinesthetic learners. As previously mentioned I also floated around the room to help individuals in a variety of ways. By working one-on-one with the students I was able to find their pace and what made the most sense to them, and teach them in that way.

Chapter Three

Delivers Effective Instruction

This standard for teachers includes four separate sections that I will touch on in this chapter. These involve communicating high standards and expectations when beginning the lesson, carrying out the lesson, extending and completing the lesson, as well as when evaluating student knowledge.

The first criteria involved communicating high standards and expectations when beginning the lesson. At the beginning of each lesson I started off with a Do-Now activity which set the standard each day of the level of work the students. Many days this set the level of prior knowledge the students were being called upon to know and often functioned as a quick review. Another important aspect of communicating the standards for each lesson, involved writing the concept or subject being taught that day on the board. This simple act communicated to the students what they were expected to be able to accomplish by the end of the lesson.

The second criteria required the teacher to communicate high standards and expectations when carrying out the lesson. I found that a very effective method of communicating standards and expectations for my students was to give the students step-by-step instructions. This was particularly beneficial for my lower level students. These step-by-step instructions let the students know exactly what they should be doing in each step of the problem. The textbook did not always have steps spelled out like this and by giving this resource to the students they could follow along in each problem they did. In addition to the lower level students, I found this extremely helpful with my ELL students who were later able to read over these steps on their own and at their own pace, to better understand the subject.

Another method of delivering effective instruction involved using a variety of teaching strategies. Typical lessons included lecture, open questions, individual practice problems, as well as a partner or group work. The variety allowed each lesson to appeal to multiple types of learners such as visual, kinesthetic, and auditory. This was also a method I used to overcome teaching in a diverse classroom. During the partner work time, students who natively spoke the same language could work together to better understand the English that was being used to ask the problem. Students who did not benefit from working with another student were able to thrive during the individual time in the class, while more outspoken students were able to verbally question and investigate the topic at hand when I asked for questions during the lesson. This allowed each student to become engaged in the lesson and learn in the way that was best for them.

Another way to deliver effective instruction is to relate the topic at hand to something outside of math. By answering the question “Why are we learning this?” I was able to reach out to the students and grab their attention. This engaged them and gave them a motivation for learning the topic. While covering financial mathematics with my Pre-Calculus students I was able to relate this to themselves as well as engineering. For example students determined financial information about themselves by choosing a car and house to make monthly payment on. I also got them excited for their future by having them calculate how much their salary would have to be to afford both the house and car while making payments on their college loans and preparing for their retirement. I found this to be an extremely effective method to teaching.

In extending and completing the lesson I assigned nightly homework. This nightly homework reinforced the topics learned in class and allowed the students to work by themselves. The students were expected to work to understand and complete the homework each night, a

standard that was clearly communicated each day. I checked the homework each day giving the students 0, 5, or 10 points based on effort and completeness, which were often one and the same.

Tests and quizzes, samples of which can be found in the Appendix, were periodically used to evaluate the students' knowledge of the material content. Exams and quizzes were made to cover topics that had been taught in the class using vocabulary and concepts that had also been taught in the class. No new material was introduced on such evaluations, making it a good indicator of student knowledge. Before each exam and quiz, the topics students were expected to be competent in were outlined to them, on the board, as well as communicated through the use of review problems or worksheets. This helped prepare the students for the topics they would see on the exam and got them more comfortable with the material. These evaluations were then graded and used to assess the students' abilities. Many times the quizzes were used to evaluate how much time needed to be spent on future topics, while tests were used to evaluate what, if anything needed to be revisited before moving forward.

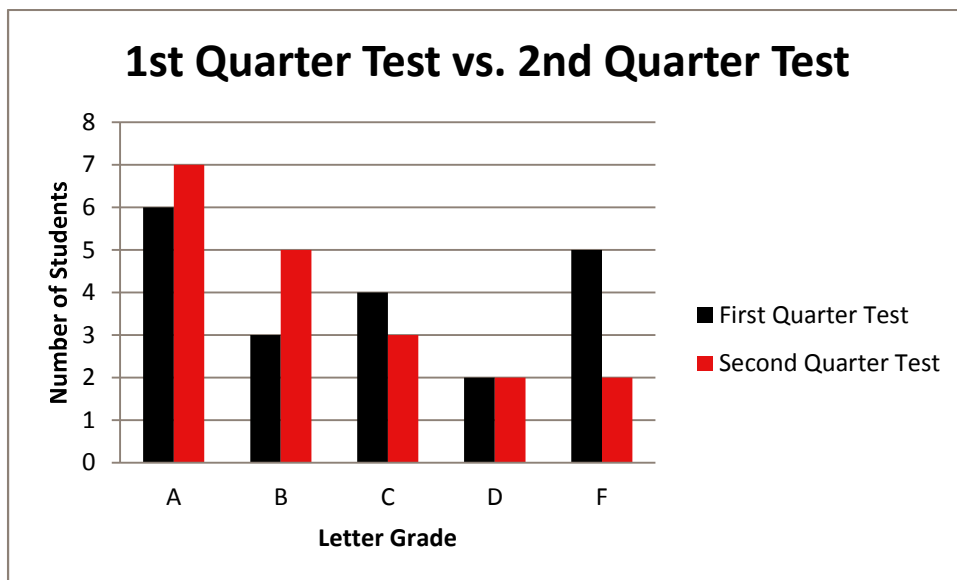


Figure 1: Student Test Grades

Figure 1 shows the grades of two tests that were taken by my Advanced Algebra class. The first test was taken in the 1st Quarter and the second exam was taken later during the 2nd Quarter. Both exams covered material that I had taught. It can be seen that student grades improved from a test taken in the first quarter to a test taken during the second quarter. Three out of five students raised their grades above failing, leaving only two out of nineteen students failing. The improvement in grades shows that students had a greater comprehension of the material and were able to perform better. Their improvement reflects my improvement in delivering effective instruction.

Chapter Four

Manages Classroom Climate and Operation

An important aspect of my teaching was to create a classroom climate where students were able to function to the best of their abilities. I found this to be a critical, yet often overlooked aspect of teaching, where students are encouraged to discover subjects for themselves. Also often overlooked is a classroom climate where students can try something and then get help if they are not able to understand the task.

I strived to create this type of environment each day. I taught with a very open classroom climate. This was encouraged by me often asking the students if they had any questions on the material or if they would like something to be repeated. This quickly turned into students becoming aware of the fact that they were allowed to ask for something to be clarified or if they had a question about the material. I additionally asked students to assist me in doing practice problems on the board, calling on individuals to describe the next step in the problem or to catch an intentionally made error.

I also found it extremely beneficial to ask my Algebra students the arithmetic problems that came from an algebra question. Asking the students simple questions within a more complex question had many benefits. For starters it reinforces material they already know. Arithmetic is commonly known by each student, however repeating it aloud allows the students to practice and the ELL students to get more comfortable with English. Students become accustomed to the environment where they could not forget something, simply because they learned it last week or last year.

Another benefit of this open classroom is that I was able to develop a strong communication with my students. Many students felt comfortable saying “Miss, I don’t get

this!” and that allowed me to assist them. It also built up a respect between me and the students. This allowed for two important aspects of teaching. The first was that it helped me to build up students who were simply defeated. Many students at Doherty do not have the best home lives or have they had great school lives ether. By their junior and senior years many are just defeated by the school system and simply trying to move on to the next stage in their life. One of my students shared that with me during my time teaching, as she spoke about how she did not want to be in school, she wanted to work with Special Education children. From there I was able to encourage her to continue in school to achieve that goal and a found ways to build up her confidence doing the work in class.

Another important result of gaining the respect of my students was that classroom management from a discipline standpoint became easier. Telling a student who has some respect for you to put away their phone and pay attention has a very different result compared to a student who has no respect for you.

No cell phones is just an example of rules that were enforces in my classroom. On my first day of teaching for each class I established the rules of conduct for that class. I wanted it to be clear to the students just because I was a young student-teacher, they would not be able to break the rules. Many of my rules came from the school rules such as no cell phones or no being tardy. Other expectations for the classroom came from what was instigated from my mentor teacher, Kathleen O’Leary. I made it clear to the students that completing their nightly homework was still an expectation. There were also my own expectations that I instigated based on my own teaching strategies and abilities.

With all this in place I had very few instances where I was required to discipline my students beyond talking to them after class. Many times I would request to talk to a student about

their actions, and there was a threat of detention or higher punishment from the administration. This was often enough for the student to settle back down. I believe this was often due to the fact that students often act up for the attention and when I discipline them in a firm but not disruptive manner it takes away the purpose of it.

Chapter Five

Promotes Equity

The fourth teaching standard is that the teacher promotes equity. This can be within many regards; equity towards foreign students, towards different socio-economic groups, towards level of students, and more.

Showing equity towards foreign students often took the place of helping them to identify with American culture and a civil community on many levels. Additionally it often took the place of assessing the proficiency of these students in the English language. These assessment were used in conjunction with good judgment to determine if instructional changes to were necessary. There was a very fine line here, in balancing being helpful to these students and being unfair to others. There was another careful balance between helping the students to identify with America and being inconsiderate towards other cultures. In particular with one student I found it beneficial to allow another to translate specific words for her. This assisted her in learning the English behind the math, as well as assimilating into American culture as the analogies were also translated.

One equity issue I was faced with was being equal towards different socio-economic groups. While teaching my Pre-calculus students logarithms, a typical homework assignment for these students required the use of calculators. While many students owned smartphones and were able to download a calculator app, I had a few students who did not have any internet enabled devices at home. These students had to find other methods to obtain a calculator which often involved them staying late at school or coming in early to complete the work. Many of these specific students also had many other family and home situations which created more difficulties in staying late or getting to school early. To walk to fine line in being inconsiderate

and being unfair to the rest of the students, I attempted to assign problems with and without calculators. This allowed the students who couldn't attain a calculator to still work on the material, even if they were unable to complete the entire assignment.

Another way I promoted equity was by listening to questions from all levels of students. In the average classroom there tends to be students who struggle and students who breeze through the material. By listening to both students I was able to promote equity within the classroom. Simply because a student had a question that the many other students wouldn't understand doesn't mean it wouldn't be answered, perhaps just separately or in conjunction with the material. Similarly, questions or comments that perhaps the entire class did not need to hear were answered completely and fairly.

One of the most important aspects of equity as promoted by the teaching standards as well as by Doherty High school was to encourage every student to do well. Many students get beat down by the school system and demoralized by failures they may have faced. Some of the cause of this may be that many of these students have not had the easiest lives, like many other children of urban environments. Encouraging students to do their best is a challenge especially when their best may not have been good enough in the past. I experience students who had no motivation to work towards their goals. They put in no effort and they often saw miniscule results. After many years of this they students are simply demotivated.

And after many years of this, teacher are still trying to encourage students to do everything they can to complete their achievements. For me, this often took the form of working with students encouraging them as they worked. One of my students had some personal issues that left her very unsure about herself. Often she needed someone to encourage her and affirm her abilities even in math. Often she would ask me 'Is this right? I don't get this!' When in

reality she had a good grasp of the material. She was able to be encouraged by taking her through a problem and affirming that she knew what she was doing. Similarly encouraging other students often took time. Time spent during class working on problems was often used to encourage students particularly with the material.

Just as I had to encourage students who were not able to fully grasp the material, I found it equally challenging, yet important, to encourage my more advanced students. Although often less vocal, these students often need someone to encourage them to go beyond what is covered in class. These students are often demoralized by the routine and are down in the rut of school. Nothing new and nothing intriguing has left them out of touch. By encouraging to find an application for the material and giving them a reason for learning the material these students became more engaged. While teaching logarithms I connected the material to finances and after hearing the connection to their lives one girl exclaims ‘Wait we’re actually going to use this, I’ve gotta pay more attention!’ Giving these students something to work for shows them that their effort will pay off as they will achieve more than they would without the encouragement.

By equally encouraging both the motivated and struggling students, more students were engaged in the class and were willing to work. This raised the level of effort on both ends of the board, bringing the entire group up a notch.

Chapter Six

Meets Professional Responsibility

The final standard for educators involves understanding moral and legal responsibilities, conveying knowledge and enthusiasm, and collaborating with colleagues. Through my teaching process I met each of these, one of the most interesting to complete was being able to convey knowledge and enthusiasm to my students. I was excited about teaching math and about the subject material, however I quickly learned that although I was very excited about the subject, I had to convey this enthusiasm. It's easier to be excited about a topic when you can see its application further down the road. To encourage this enthusiasm, I found it helpful to make connects to the students, by finding a way to give the math an application. I also found that although my students were not excited about the math, I could get their enthusiasm fired up in other ways. Class competitions during activities were a way to get students engaged with the subject material. This was particularly effective with the boys and with students who were athletes as the competition was often sports related. For example I played a World Series themed BINGO and a math Knock-out game.

For students who were not particularly competitive, I found that through puzzles or challenging activities I was able to convey my enthusiasm for math and logic. One particular activity, involved the students putting together puzzle pieces to piece together a quote from Albert Einstein. One of my students put her mind to figure out that quote and to achieve that goal she needed to complete all the math and she got excited about the material.

Another important aspect of meeting professional responsibilities is the legal aspect of teaching. Being organized about grades is an important way to legally stay on top of my teaching. To do this I used Engrade, an online website that allows teachers to organize their

classes, assignments, tests, and grades. It is also beneficial because students are allowed to access their personal accounts and see their grades and assignments. This was recommended to me by my colleagues at Doherty as they had found it extremely helpful in their teaching process and they were able to maintain good grading.

Additionally, I adhered to the legal aspects of teaching in my use of the curriculum frameworks given out by the state for each subject. These legal standards for the subject matter taught are set out by the state and by the Common Core. During my teaching I followed these standards to plan lessons and to determine what topics to teach in what order. These standards were also conveyed to students so that they were able to have a concrete goal in mind. The curriculum frameworks also set the standard on the tests and quizzes used to determine the student's knowledge of the material.

Moral responsibility is another qualification for teachers, which differ from their legal responsibilities. One moral aspect I faced was having to dress and act older than I actually was when teaching. Most of my students were juniors and seniors, making them three to four years younger than myself. This is a very small age gap and in many other situations I would have connected very differently with them than I did as a teacher. However given the situation I found that I had to dress more maturely than some of the older teachers. I found that this made it easier for the students to look up to me as an authority figure as opposed to a peer.

Another one of the large moral responsibilities I faced was in finding the balance between helping a failing student to succeed and just teaching the material. It is easy to simply say 'oh well my responsibility is to teach and I've done my part, they simply didn't do theirs' and let the student fail. However I found that a very important aspect of teaching is to teach more than the material. Teaching students to succeed is an important aspect of being a teacher. I worked with

my students to encourage them to do well, even if for them doing well was a barely passing grade. I also strived to teach my students topics that go beyond the material. For example teaching studying techniques is beneficial as they can be applied in many classes. I also strived to find the best way to teach my students personally so that I was able to help them with more than the math.

Teachers are faced with a huge amount of responsibility and some of it can be summed up in the name teacher. However there is also a large amount of moral responsibility, which I found in the question of what to do with an irresponsive student. As a teacher do you let them fail or are you morally responsible to come alongside them and try to teach them how to succeed? I found the answer to be the latter, seeing that I did more than just teach math to my students.

Chapter Seven

My Worcester Polytechnic Institute Education

In my teaching experience my education at Worcester Polytechnic Institute (WPI) has helped me considerably. Without this education I would not have the mastery knowledge of the subject matter which some of my classes required in their curriculum. I have taken a plethora of math classes here at WPI. In many of these classes I would help other students in my class be teaching them the material. This gave me a better mastery of the subject and helped me to be more confident in teaching a classroom of students.

Being a student as well as a teacher gave me some ideas as to what type of teaching methods I liked or didn't like. Paying attention to how my professors have taught and were teaching at the time allowed me to take these ideas and apply them to a high school setting. Seeing what is effective in conveying information and what is lost to the crowd is very different from the students' point of view than it is from the teacher's. Being in both roles at once allowed me to learn and observe both sides.

I have also learned some of the subject matter that I taught in some of my classes. For example, during this past B-term I took a Project Evaluation class which learned about the economic analysis of construction projects and other engineering applications. At the same time I taught basic financial math to my Pre-Calculus students. Having taken a course which covered some of the material they were learning allowed me to give a different perspective on it than their textbook did. It also gave me more material to work with in teaching this subject. I also found it a good tool to use to encourage my students. After they had learned some of the material, I brought in one of my exams from that class and we did one of the problems on that test. They loved being able to see that what they were learning reached farther than simply their

test. It was also encouraging for them to do problems from an *actual college exam!* In many cases this was exciting for them, as they were able to have an accomplishment greater than just getting an A on a test.

This was also a case where I was able to bring in outside perspective about the material. There were many cases where I was able to answer the question ‘so what can I use this for?’ Many of the students in my Pre-Calculus class were interested in engineering, so I linked many of our practice problems to engineering. Since I am studying Civil Engineering, many of my applications were based on buildings, bridges, and roads. However, even if my students weren’t specifically interested in hearing about civil engineering, I found they were interested in hearing about different jobs they could have. They were intrigued when I was able to point the bridge construction on Route 9 over Lake Quinsigamond and tell them specific information about the bridge because of an internship I had last summer.

In addition to determining cost analyses of projects, the students were able to apply this financial math to personal uses. One particular project involved the students calculating the cost of living that they might face a few years out of college. The students were able to choose a used car and a house to buy, then calculate their monthly payments for the house, car, college loans, and retirement savings. Though tedious, the students found this activity interesting as they were able to apply it to themselves and see the use it has in everyday life.

Logarithms are another topic that students often have trouble finding an application for. All the students see is this arbitrary looking line, based on some number that is so long it’s just given a letter. This made giving the students an application even more helpful in teaching them the material. Again my civil engineering background revealed itself as I was able to connect these logarithmic functions to the codes for building designs. I found two particular design

aspects that were connected with the material they were learning. By looking at earthquake effects, which are modeled by a logarithmic function, I showed them that this affects the factor of safety used in the building codes. After having them calculate the factor of safety for Worcester, MA as opposed to San Francisco, CA I was then able to explain to them some of the background engineering that goes into designing a building. It was awesome to be able to point to aspects of the building they were in and explain how the math they were doing connected.

Another instance where I was able to connect the material was in the effects of sound intensity. I explained to the students that when designing a building there is more taken into consideration than just where the walls and doors should go. Sound is a factor that many architects consider. Our class wouldn't be very productive if we could always hear the Spanish class next door. So I had my students calculate the sound intensity from different situations and think about how that would affect the design of the walls in a school.

Overall I found that by having a background in another subject I was very qualified to teach math. Studying engineering I had plenty of math courses to give me a foundation to teach from. In addition to mastery of the material, I also had an application for what was being taught. Students loved being able to apply their education to themselves or the world around them. It was great being able to ask them to think a bit outside of the box and find a purpose in their learning.

Chapter Eight

Period Two- Advanced Algebra

This was the first class I picked up in my teaching. They were my challenge class as everyone was a very eclectic mix. I had started teaching with 19 students and that number grew to 22. A number of students had IEP's and there were a good number of ELL students. One particular student of mine, Naisha had only been speaking English for a year after moving here from the Dominican Republic. Her attempts to understand the material were admirable as she worked at each assignment, despite not always making a large amount of progress with the material. Luckily for her, she had another ELL friend in the class, Jose. Although Jose's English was not phenomenal, he was able to translate some of the information for Naisha. On many occasions as I would explain something to Naisha, Jose would be called over or come over and begin to translate for me.

Another one of my ELL students was Rama. After joining us part way through my time teaching, Rama was quickly one of my top students. Although her English was incomprehensible, her math was not. On my last day of teaching, we had a game where we played Pictionary on the board. While many of the ELL students chose not to draw on the board, she came up at one point and the word to draw was "bucket" however she did not know what this was. Even on my last day of teaching I was taken aback by how well she did in the class, despite such a limited vocabulary.

Another one of my students never ceased to surprise me. Ayub, a tall, lanky soccer player from Africa, never quite got the math but he always had a heart of gold. He was always smiling and looking out for others around him. Although his effort could usually have had space for improvement when I took the time to work through the math with him, he did what he could.

One day as I was helping him work through an in-class problem I began to understand why he didn't always have the necessary background for the material. When I asked him if he remembered adding numbers one on top of the other back in elementary school he responded simply 'Miss, I did not go to elementary school.' This took my aback as the thought of these students having no elementary background was something I had never even considered.

There were also a couple students who really paired up in my class, Deandra and Jordan were two such students, although Deandra would deny it at all costs. Although not a couple, these two often effected each other's behavior. Jordan often had a different attitude when Deandra's schedule, which did not prioritize school, allowed for her attendance of this class. They often had questions during lectures and I could tell that both were intelligent however did not always apply themselves.

Romina and Miriam, were another pair of my students. Both completed their homework religiously and were always paying attention in class. The only difference in the two was their comprehension of the material. Romina often did not understand what was going on and needed to have it explained to her multiple times. Miriam, however, never had an issue with learning the material and enjoyed being challenged by extra problems. Valerie was another student in my class who excelled beyond the others. Although she is the youngest in the class as a sophomore, I could always count on her and Miriam to have a question on the material or be able to answer an in-class problem.

Valerie was also always happy to help and encourage other students in the class. I often paired her up with another student Amber who was always down on herself and needed constant affirmation. Another student I often paired Valerie up for group work was Lissette. Lissette did not want to be in school and often let her teachers know it. Although she never gave me any

issues, she was suspended multiple times during my time teaching and had many behavioral and other issues. After speaking with her I learned that she really wanted to work in childcare with autistic or special needs children and really wanted to go back to South High, where they had a program for this type of career.

Another student who like Lissette had great potential but little motivation was Meghan. Due to an illness she missed a large amount of class, but was quickly able to make it up and catch up to the rest of the students. She was often discouraged in her studies and I believe this when it was paired with some issues from home, led her to strongly considering dropping out. She never did, but from speaking with her I got the impression she saw it as a reasonable option.

This class was filled with many more students each of whom had a very distinct personality; there was no norm. Overall they were not engineers, and for the most part their interest in the math was limited to passing the class, although many were not. This made it challenging to get them engaged in the material, and excited to learn.

Period Four- Pre-Calculus Honors

Unlike my Algebra class this class, which I picked up second, had a very strong norm. Students came in at the last minute, did every assignment, then sat half asleep and silent throughout every class. This thirty student class had many students from the Engineering and Technology Academy (ETA) at Doherty. One would think that the more students in a class the less manageable it would be, however I did not face that issue. There were no disciplining issues with these students merely trying to get them to interact during class. On day one of teaching this class I went through my lesson plan which was planned much like my Algebra lessons were. I learned quite quickly that I could not teach them like I taught my Algebra students. The way to motivate these students was different. They needed a bit of challenge and a lot of application.

Pre-calculus can be tiresome as many of the topics set you up for applications in calculus and other math, however it does not always present itself as useful. I found that by giving these students an application or some motivation they were able to explore the topic more on their own and speak up a bit.

One student I could always count on to be talking during class as Lucas. I often had to refocus him to the material at hand, to which he always had a witty comment to respond to me with. He also came ready with many questions for the material, as well as not material based. It seemed to me like many of these questions stemmed from a slight boredom with school. Like many of the other students in the class, Lucas was very intelligent, but seemed bored with the school system.

Another such student who seemed bored with the monotony of school was Julia. Julia sat in the back of the classroom where she made no trouble, finished all her work, paid attention, and maintained one of the highest grades in the class. When she made mistakes on her test and exams they were often algebraic errors and the material content was correct. She reminded me much of myself in high school in her casual attitude. She often finished the night's homework after completing the in-class problems while she waited for everyone else to finish. When asked about it she seemed to shrug it off and mumble about how she finished the in-class problems and just kept working.

Additionally, this class did have some students who presented more of a struggle. Menal was one such student who struggled greatly with the material. However this would have been easier as a teacher if she admitted to not understanding the topic. While working on in-class problems I often would go to help her but she often shooed away my assistance saying she knew what to do from there.

Christian also was a challenge to teach as he missed a large amount of class time. He is very passionate about his heritage as a Native American; however this passion did not flow into math. After missing large amounts of material and class time, he made no effort to remake the material or understand the concepts. He stood out to me because despite my attempts to help him with the material, he did very little to reciprocate the effort.

Dominique was another student who stood out to me, just in a different way. As I interacted with him throughout my time, I learned that with a little prodding he would speak up and begin to engage in the class. Dominique also presented a challenge to me because he had very little at home. Particularly he had no internet at home, which presented itself as a challenge when I assigned homework that used a graphing calculator. Now most students did not own a graphing calculator so my solution was for them to download an app, as many of them had smartphones, or google one. This was not an option for Dominique and was a challenge that I was not prepared to face. As the daughter of a computer systems consultant, I've always had internet in my house and found it surprising that there were still people who did not.

Although there was a strictly adhered to norm in this class, this was a class of students who were motivated beyond many of their peers and needed to be motivated in their own way.

Period Six- Pre-Calculus Honors

This was the third and final class I taught. Compared to my fourth period they were half the students, half the focus, and twice the noise. There were sixteen students in the class and the class was a close-knit group. This had its benefits and its challenges. As I learned it's hard to move a student away from their friend when you can separate them by at most two seats, and chances are the two students between them are also their friends.

One of my most chatty students was Cole, who did his work and performed well, but it was evident his focus on school was really more on the social aspects. His relaxed demeanor was nice in a small class that was more laid back, but I often had to draw his attention back to the lesson. This often worked well as it got the attention of everyone in the class, so daydreamers were also pulled back into the lesson. Opposite of Cole, Megi hardly spoke a word each class. However, it is evident by her performance and her work that she is still engaged in the lesson. As another student with limited time spent in the English language, Megi managed to excel past many of her classmates when it came to math, asking questions and sharing answers only when prompted.

This class was very ideal for an open question style of teaching. In addition to its small size, many students functioned very well by talking through material and asking content questions. Kiara and Nanette were two such students. Nanette often had excellent questions, pushing the material beyond the calculations and Kiara often had more content based questions, about possible ways to do something or separate calculations. Kiara was a come from behind student who shows that hard work has paid off. She works hard at every assignment and will not let you move on until she comprehends the material. These characteristics made both girls good indicators to me of where the class was at, because if the two of them didn't understand a concept, it was likely a majority of the class also was not.

Daniel was another student of mine that came with an individual set of problems. Having transferred into the class halfway through from a different school, Daniel's background knowledge was spotty. He did very well with concepts that were introduced as completely new topics, but when there was background knowledge involved he had some catching up to do. This often caused him to spend more time and effort than other students to keep up with the class.

There were also a few students who did not have the effort and motivation for this class. Jenna was one girl in particular who enjoyed sitting in class and falling asleep or giving me a very pouty face. Often her homework came in with only the answers written, which I assumed came straight from the back of the book and did not give her credit for. She did very little to understand the material and was not receptive to assistance. Janneth and Viktor were two other students that often struggled with the material. Their effort was spotty and though they generally completed the homework, there was little done to keep up with the other students.

Another student that was a challenge to teach was Drew. Drew was an atypical Doherty student; however he might fit in very well with a typical WPI student. As a junior on Doherty's math team he consistently scored the highest and was very competent in logic and math based thinking. This competency left him in a very different place than many of his peers and he did not find it beneficial to pay attention in class or do the homework. His test and quiz grades averaged about 93% while his homework was completed about 10% of the time. Material he already knew he whizzed through and much of what he didn't know he was able to figure out, when he needed to. This made it all the more frustrating when he slept through many classes in the front row. Many times I tried to challenge Drew, give him harder problems or give him harder material to try and figure out himself; however he never took to it. He seemed content putting in no effort and still passing by.

As a whole this class was very responsive, they were engaged in lessons and responded with questions and critical thinking. Although I don't believe many aspired to become engineering, they also appreciated the applications I gave, many of which were engineering related. To quote Nanette "Finally, we actually get to use something we've learned!"

Conclusion

Overall I found my experience teaching to be challenging in many ways. Although I have extensive knowledge of the material being taught, I was always looking for new ways to explain topics or convey knowledge. Planning instruction began as a daily ordeal and I eventually became more comfortable with it. Keeping the classroom under control was also very important at the beginning; however it stayed an important role in my teaching. Meeting the professional responsibilities of teaching also had hidden challenges. The debate of how to respond to an apathetic failing student was not one I had considered before. Learning to encourage my students was a very important aspect of my teaching practicum.

The evidence towards my meeting of the five teaching standards has been outlined in the previous chapters. However the experiences I have had from having a mentor, being in an urban school setting, and being in front of an actual class are irreplaceable and have given me the ability to confidently and successfully teach.

References

- Board of Elementary and Secondary Education. "603 CMR 7.00: Regulations for Educator Licensure and Preparation Program Approval - Education Laws and Regulations." *603 CMR 7.00: Regulations for Educator Licensure and Preparation Program Approval - Education Laws and Regulations*. Massachusetts Department of Elementary and Secondary Education, 26 June 2012. Web. 04 Mar. 2014.
- "District/School Administration Administration Education Reform." *Education Reform Progress Report*. Massachusetts Department of Elementary and Secondary Education, 1 May 1997. Web. 12 Sept. 2013.
- "English Language Learners." *English Language Learners*. Massachusetts Department of Elementary and Secondary Education, 28 Aug. 2013. Web. 12 Sept. 2013.
- "Massachusetts School and District Profiles." *Student Data*. Massachusetts Department of Elementary and Secondary Education, Summer 2013. Web. 12 Sept. 2013.
- National Governors Association Center for Best Practices, Council of Chief State School Officers. "Common Core State Standards." *Common Core State Standards Initiative*. National Governors Association for Best Practices, 2010. Web. 8 Sept. 2013.
- Peterson, Paul E., Ludger Woessmann, Eric A. Hanushek, and Carlos X. Lastra Anadon. *Globally Challenged: Are U.S. Students Ready to Compete?* Rep. Harvard's Program on Education Policy, Aug. 2011. Web. 8 Sept. 2013.
- "Trends in International Mathematics and Science Study (TIMSS) - U.S. States' Mathematics and Science Achievement in 2011." *Trends in International Mathematics and Science Study (TIMSS) - U.S. States' Mathematics and Science Achievement in 2011*. National Center for Education Statistics, n.d. Web. 12 Sept. 2013.

Appendix

Advanced Algebra Test

Advanced Algebra Test

Name _____

Date _____

1. FOIL.

$$y = (x - 7)(x + 3)$$

$$y = \underline{\hspace{4cm}}$$

2. Factor.

$$y = x^2 - 12x + 27$$

$$y = \underline{(\hspace{2cm}) (\hspace{2cm})}$$

3. Factor.

$$y = 6x^2 + 7x + 2$$

$$y = \underline{(\hspace{2cm}) (\hspace{2cm})}$$

Given $y = 2x^2 - 4x + 5$

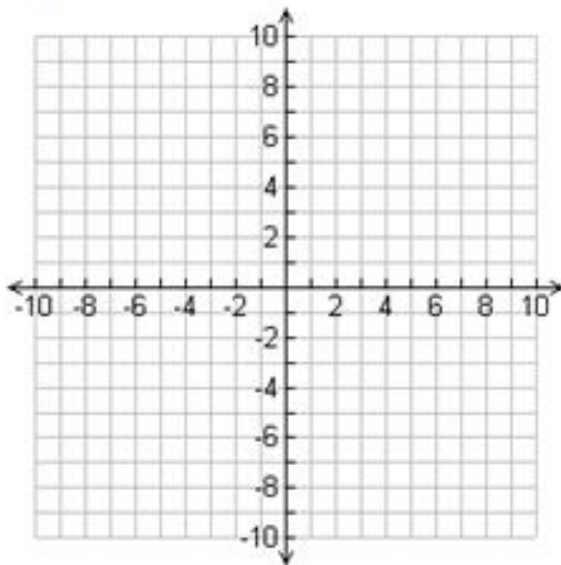
4. Find the axis of symmetry.

$x =$ _____

5. Find the vertex.

Vertex: (_____ , _____)

6. Graph.



Advanced Algebra Worksheet

Completing the Square Worksheet
Advanced Algebra

Name _____
Date _____

Solve for x.

1. $x^2 + 2x = 5$

$$x^2 + 2x + \underline{\hspace{1cm}} = 5 + \underline{\hspace{1cm}}$$

$$x^2 + 2x + \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$$

$$(x + \underline{\hspace{1cm}})^2 = \underline{\hspace{1cm}}$$

$$x + \underline{\hspace{1cm}} = +\underline{\hspace{1cm}}$$

$$x = \underline{\hspace{1cm}}$$

$$x + \underline{\hspace{1cm}} = -\underline{\hspace{1cm}}$$

$$x = \underline{\hspace{1cm}}$$

Add $(\frac{2}{2})^2$ to both sides.

Add terms on right side.

Factor left side to get $(x + \frac{2}{2})^2$.

Take the square root of both sides and solve for x.

2. $x^2 + 4x = 60$

$$x^2 + 4x + \underline{\hspace{1cm}} = 60 + \underline{\hspace{1cm}}$$

$$x^2 + 4x + \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$$

$$(x + \underline{\hspace{1cm}})^2 = \underline{\hspace{1cm}}$$

$$x + \underline{\hspace{1cm}} = +\underline{\hspace{1cm}}$$

$$x = \underline{\hspace{1cm}}$$

$$x + \underline{\hspace{1cm}} = -\underline{\hspace{1cm}}$$

$$x = \underline{\hspace{1cm}}$$

3. $x^2 + 8x = 7$

$$x^2 + 8x + \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$$

$$(x + \underline{\hspace{1cm}})^2 = \underline{\hspace{1cm}}$$

$$x = \underline{\hspace{1cm}}$$

$$x = \underline{\hspace{1cm}}$$

4. $x^2 - 16x = -63$

$(x + \underline{\hspace{2cm}})^2 = \underline{\hspace{2cm}}$

$x = \underline{\hspace{2cm}}$

$x = \underline{\hspace{2cm}}$

5. $x^2 + 18x = 11$

6. $x^2 - 8x = 9$

7. $x^2 + 24x = -119$

Advanced Algebra Worksheet

Algebra 2
Graphing Quadratics

Name _____
Date _____

Equation		Up/Down	Axis of Symmetry	Vertex	Graph
$y = -x^2 + 2x + 3$	a = b = c =				
$y = 2(x - 1)^2 + 3$	a = h = k =				
$y = 4(x - 3)(x - 5)$	a = p = q =				
$y = 10(x + 2)^2 + 2$	a = h = k =				
$y = -3x^2 + 12x - 1$	a = b = c =				
$y = -(x + 4)(x - 2)$	a = p = q =				

$y = 2x^2 - 2x + 4$	a = b = c =				
$y = (x - 5)(x + 1)$	a = p = q =				
$y = \frac{1}{2}x^2 + x + 5$	a = b = c =				
$y = \frac{3}{4}x^2 - 3x - 6$	a = b = c =				
$y = __x^2 + __x + __$	a = b = -2 c =		x = 1	(1, 3)	
$y = __(x - __2)^2 + __$	a = -1 h = k =			(2, 3)	

Pre-Calculus Honors Lesson Plan

HW: pg 110 # 42-56 even,
47-70, 75-76

POLYNOMIALS OF HIGHER DEGREES

MON 10/21

9:41-10:23

DO NOW:

You have 200 ft of fence and you want to make a pen with a fence cutting through it. What are the dimensions?



Polynomial Functions

- smooth + continuous



Form:

$$f(x) = a_n x^n + a_{n-1} x^{n-1} + \dots + a_2 x^2 + a_1 x + a_0$$

where n is a positive integer + $a_n \neq 0$.

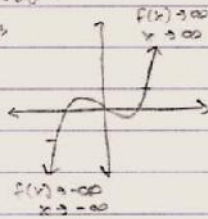
Leading Coefficient Test

given $f(x) = a_n x^n + \dots + a_1 x + a_0$ $a_n \neq 0$

Rises + Falls in the following manner...

n is odd?

ex. x^3

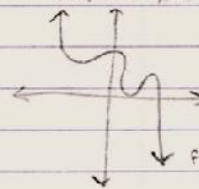


$a_n > 0$ (positive)

Falls to the left

+ rises to the right

$f(x) \rightarrow \infty$ $x \rightarrow -\infty$



$f(x) \rightarrow -\infty$ $x \rightarrow \infty$

can guess $a_n < 0$?

opposite

Predict end behaviors:

both up

$$x^6 + x^5 + 1$$

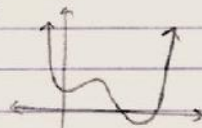
fall left + rise right

$$3x^3 + 2x^2 + x$$

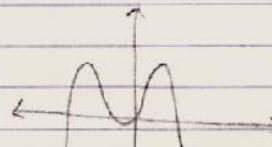
down

$$-x^4$$

n is even?



$a_n > 0$ rises left + right



$a_n < 0$ falls left + right

Advanced Algebra Lesson Plan

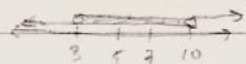
word "A"
9/25
8:52 - 9:14

TOPIC: Linear Inequalities

20 Min: Solve and graph **CHECK HW!!**
 $4x + 8 < -12$
 $-10x - 200 \geq 50$
*** DO NOW**

OBJECTIVE: SWBAT solve and graph compound inequalities


LESSON: Till now we solved inequalities with and inequality now we're going to learn about compound inequalities. A compound with two inequalities is a compound. This can be written as $3 < x < 10$ or in our "or" form of $x < 2$ or $x > 5$. So lets start by graphing the first inequality use the same # line as before however we now have two circles on our graph.



note that we use open circles

Its as if we graph $3 < x$ and $x < 10$ then take the part both cover.

This is different from when we graph $x < 2$ or $x > 5$



because x could be less than 2 or greater than 5.

Can someone walk me through graphing $-9 \leq x \leq 4$?

Worksheet 116 #1-10, first column. Use a separate sheet.

HW 2nd column of worksheet # 8, 11, 14, 17, 20, 23, 26, 29, 32